



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,422	06/02/2005	Serge Tretjak	FR-AM 1905	3179

31684 7590 10/30/2007  
ARKEMA INC.  
PATENT DEPARTMENT - 26TH FLOOR  
2000 MARKET STREET  
PHILADELPHIA, PA 19103-3222

EXAMINER

OH, TAYLOR V

ART UNIT	PAPER NUMBER
----------	--------------

1625

MAIL DATE	DELIVERY MODE
-----------	---------------

10/30/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

**Application No.**

10/537,422

**Applicant(s)**

TRETJAK ET AL.

**Examiner**

Taylor Victor Oh

**Art Unit**

1625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 29 July 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>6/2005</u> . | 6) <input type="checkbox"/> Other: _____  |

Art Unit: 1625

The Status of Claims:

Claims 1-7 are pending.

Claims 1-7 are rejected.

DETAILED ACTION

1. Claims 1-7 are under consideration in this Office Action.

Priority

2. It is noted that this application is a 371 of PCT/FR03/03598 (12/05/2003), which has a foreign priority document, France 02/15348 (12/05/2002).

Drawings

3. The drawing filed on 6/02/2005 is accepted by the examiner.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-7 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for  $\text{H}_2\text{SO}_4$ ,  $\text{H}_3\text{PO}_4$ , methanesulfonic acid or Amberlyst 15 as a catalyst, does not reasonably provide enablement for any catalysts generally. The specification does not enable any person skilled in the art to which it

Art Unit: 1625

pertains, or with which it is most nearly connected, to include all kinds of catalysts unrelated to the claimed invention commensurate in scope with these claims.

Furthermore, the instant specification fails to provide information that would allow the skilled artisan to practice the instant invention without **undue experimentation**.

Attention is directed to *In re Wands*, 8 USPQ2d 1400 (CAFC 1988) at 1404 where the court set forth the eight factors to consider when assessing if a disclosure would have required undue experimentation, citing *Ex Parte Forman*, 230 USPQ 546 (BdApls 1986) at 547 the court recited eight factors:

- 1) the quantity of experimentation necessary,
- 2) the amount of direction or guidance provided,
- 3) the presence or absence of working examples,
- 4) the nature of the invention,
- 5) the state of the prior art,
- 6) the relative skill of those in the art,
- 7) the predictability of the art, and
- 8) the breath of the claims.

#### **The Nature of the Invention**

The nature of the invention in claim 1 is in the followings:

Art Unit: 1625

1. (currently amended) A continuous process for the preparation of ethyl lactate (I) by esterification of lactic acid [or of a lactic acid composition] using ethanol according to the reaction (I):



(I)

~~which consists in~~ comprising reacting said lactic acid with ethanol according to an ethanol/lactic acid molar ratio at least equal to 2.5, in the presence of a catalyst, at a

### The State of the Prior Art

The states of the prior art are described as followed:

Gabriel et al (U.S. Pat. No. 1,668,806) who prepared 1-butyl lactate by dehydrating 70% lactic acid with excess 1-butanol at 117° C., followed by addition of HCl catalyst, followed by refluxing and esterification with addition of excess 1-butanol and drawing a 1-butanol water azeotrope overhead. The process involved dehydration of the system and removal of water prior to the esterification step.

Bannister (U.S. Pat. No. 2,029,694) describes a method for producing esters that have boiling points of at least 120° C. The lactic acid and acidic catalyst are charged to a reactor

Art Unit: 1625

and heated to the boiling point of the ester or not less than 20° C. below this temperature. The alcohol is introduced into the reactor below the surface of the hot partially dehydrated acid. The ester, water of reaction, and excess alcohol are taken off overhead. For example, methyl lactate is formed at temperatures from 130 to 140° C. by introducing methanol into partially dehydrated lactic acid. The overhead distillate is 8–10% water, 42–42% methanol, and 50% methyl lactate, by weight. For every 4.8 moles of methyl lactate produced in the system a total of 17.9 moles of methanol is fed to the system. Most or all of the water taken overhead (5.0 moles) is produced by the esterification reaction. The effective feed water level is 0.2 moles. This means that the feed streams are essentially water free.

Weisberg et al (US 2,406,648) discloses the following summary process:

In general, a method in accordance with the present invention includes esterifying an alkali metal or alkaline earth metal lactate with a lower alkyl alcohol, the lactate ester of which is water-soluble such as, for example, methyl, ethyl, or isopropyl alcohol, in the presence of a strong mineral acid. During the formation of the ester, the action of the acid on the lactate salt unavoidably causes the formation of an alkali or alkaline earth metal salt, which with impurities in the lactate salt raw material forms a sludge which has the tendency to occlude and retain tenaciously a portion of the ester. The method of the present invention includes flash distillation of the ester, any excess alcohol and the water present or formed during esterification under conditions such that a clean separation of the liquid from the sludge is obtained. The liquid components may then be distilled to separate the alcohol from the aqueous solution of the ester and the water is then distilled off azeotropically to produce a substantially pure anhydrous ester.

As the prior art have been discussed in the above, there is no conclusive data that all kinds of catalysts would be required to produce the final desired product except some acidic esterification catalyst, such as, a strong mineral acid.

**The predictability or lack thereof in the art**

In the instant case, the instant claimed invention is highly unpredictable since one skilled in the art would recognize that any catalyst would not work on the claimed process in the same way as the catalyst such as  $\text{H}_2\text{SO}_4$ ,  $\text{H}_3\text{PO}_4$ , methanesulfonic acid or Amberlyst 15 disclosed in the specification. For example, Gardener (US 3,878,261) discloses the super acid catalyst of  $\text{SbF}_5$  and  $\text{CF}_3\text{SO}_3\text{H}$  used for isomerizing paraffins containing 4 to 12 carbons in a feed stream (see abstract page); furthermore, according to the text book, March's Advanced Organic Chemistry (March et al, 4<sup>th</sup> ed. 1992), it describes that another super acid,  $\text{FSO}_3\text{H-SbF}_6$ , is used in the formation of a carbocation, such as tert-butyl cation (see p. 219, the fourth paragraph) from isobutane unlike the claimed process.

Furthermore, the specification of the claimed invention does support the very idea of the unpredictable aspect of the catalysts by disclosing the specific and workable catalyst for the esterification in the above, not all kinds of the catalyst known in the art.

Moreover, chemical reactions are well-known to be unpredictable, *In re Marzocchi*, 169 USPQ 367, *In re Fisher*, 166 USPQ 18. Additionally, catalytic processes, such as are present here, are inherently unpredictable. The U.S. District Court District of Connecticut held in *MOBIL OIL CORPORATION v. W.R. GRACE & COMPANY*, 180 USPQ 418 that "there is an inherent mystery surrounding the

Art Unit: 1625

unpredictability of the performance of catalysts; a mystery which is generally recognized and acknowledged by chemists in the cracking art. This is one more reason why the presumption of patent validity "should not be disregarded especially in a case of this sort where the intricate questions of [bio]chemistry involved are peculiarly within the particular competence of the experts of the Patent Office." *Merck & Co. v. Olin Mathieson Chemical Corp.*, 253 F.2d 156, 164, 116 USPQ 484, 490 (4th Cir. 1958)".

"The catalytic action can not be forecast by its chemical composition, for such action is not understood and is not known except by actual test, *Corona Cord Tire Co. v. Dovan Chemical Corp.*, 276 U.S. 358, 368-369 (1928). Also see, *Application of Grant*, 304 F.2d 676, 679, 134 USPQ 248, 250-251 (CCPA 1962); *Rich Products Corp. v. Mitchell Foods, Inc.*, 357 F.2d 176, 181, 148 USPQ 522, 525-526 (2d Cir. 1966), cert. denied 385 U.S. 821, 151 USPQ 757 (1966); *Ling-Temco-Vought, Inc. v. Kollsman Instrument Corp.*, 372 F.2d 263, 268, 152 USPQ 446, 450-451 (2d Cir. 1967); *Georgia-Pacific Corp. v. United States Plywood Corp.*, 258 F.2d 124, 132-133, 118 USPQ 122, 128-129."

Therefore, from the above, it is clear that the use of a generic phrase "a catalyst" can not ensure to form the desired claimed product in a good yield.

#### **The amount of direction or guidance present**

The direction present in the instant specification is that not any catalyst can be led to the formation of the desired product. According to the specification, it is silent as



Art Unit: 1625

to how any acidic catalyst can be led to the formation of the desired product and fails to provide guidance as to whether any acidic catalyst is sufficient enough to allow to form the desired product in sufficient quantities; the specification fails to provide a correlation between the claimed process of the invention and the functional language of any acidic catalyst .

#### **The presence or absence of working examples**

In the instant case, the claim encompasses all the various catalysts. Applicants' specification provide only one particular exemplified catalyst compounds ,such as sulfuric acid as shown in the specification (see page 8). However, this can not be the representatives for all the catalysts which would work for the claimed process. Thus, the specification fails to provide working examples as to how other types of catalysts can be resulted in the claimed products, i.e. again, there is no correlation between the functional language of any catalyst and the desired final product.

#### **The breadth of the claims**

The breadth of the claims is that any acidic catalyst would work on the claimed process in the same way as those disclosed catalyst in the specification without considering the affect or impact of the different types of catalysts on the starting compounds; for example, the super acid  $\text{FSO}_3\text{H-SbF}_6$  disclosed in March's Advanced Organic Chemistry (March et al , 4<sup>th</sup> ed. 1992) has a high likelihood of removing hydrogen ions from the reactants, instead of helping them to form the desired product , thereby detrimentally affecting the yield of the desired final product.

**The quantity of experimentation needed**

The quantity of experimentation needed is large. One of skill in the art would need to determine which one of the catalysts would be capable of forming the desired product and would furthermore then have to determine which one of the catalysts would not be resulted in the claimed desired compounds in a sufficient quantity.

**The level of the skill in the art**

Even though the level of skill in the esterification is high, the skilled artisan employing this process would be a BS chemist working in the a laboratory facility. He would know how to use the taught catalyst, but not how to select other catalyst without trail and error.

Therefore, in view of the Wands factors and In re Fisher (CCPA 1970) discussed above, to practice the claimed invention herein, a person of skill in the art would have to engage in undue experimentation to test which acidic catalyst can be employed to produce the desired claimed compound encompassed in the instant claims, with no assurance of success.

***Claim Rejections - 35 USC § 103***

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

Art Unit: 1625

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weisberg et al (US 2,406,648) .

Weisberg et al (US 2,406,648) discloses the following summary process

(see col.

2 ,lines 23-45):

Art Unit: 1625

In general, a method in accordance with the present invention includes esterifying an alkali metal or alkaline earth metal lactate with a lower alkyl alcohol, the lactate ester of which is water-soluble such as, for example, methyl, ethyl, or isopropyl alcohol, in the presence of a strong mineral acid. During the formation of the ester, the action of the acid on the lactate salt unavoidably causes the formation of an alkali or alkaline earth metal salt, which with impurities in the lactate salt raw material forms a sludge which has the tendency to occlude and retain tenaciously a portion of the ester. The method of the present invention includes flash distillation of the ester, any excess alcohol and the water present or formed during esterification under conditions such that a clean separation of the liquid from the sludge is obtained. The liquid components may then be distilled to separate the alcohol from the aqueous solution of the ester and the water is then distilled off azeotropically to produce a substantially pure anhydrous ester.

The amount of alcohol used to assure complete esterification of the lactic acid may vary between 3 parts and 6 parts by weight for each part of lactate salt calculated on a 100% basis. 5 The optimum ratio, considering the thermal economics involved, is about 4 to 1. When less than 3 parts by weight of alcohol are used, the reaction does not go to a satisfactory completion and when more than 6 parts by weight of alcohol 0 are used, the excess alcohol serves no useful purpose and must be removed by distillation later, thereby increasing the cost of the product. (see col. 4, lines 30-42)

Art Unit: 1625

The temperature of the oil in the kettle is maintained sufficiently low to avoid charring or decomposition of any components of the esterified mixture, but sufficiently high to vaporize the ester, alcohol and water almost instantaneously. The temperature of the oil preferably is maintained between about 85° C. and 145° C. when distilling methyl lactate. Higher temperatures may be used, but this may be undesirable as charring of some components of the mixture may occur. The oil may be maintained at the desired temperature by the use of steam circulated through the coil 32 or by any other desired type of heating means. Despite the fact that methyl lactate boils at 144° C., the vapors of alcohol and methyl lactate and the water vapor leave the oil at about 80° to 100°

(see col. 5 ,lines 32-47)

passed to a preheater 37 and then to a fractionating column 38 having a still kettle 39 at the bottom thereof, containing a steam coil or other equivalent heating means. This still is operated in such a fashion as to distill off the alcohol which is drawn off near the top of the column, delivered to a condenser 40 and thence returned through a surge or storage tank 41 to the alcohol storage tank 14 by means of a pump 42 or by gravity if the condenser is located above the storage tank. A portion of the alcohol may be returned to the column 38 as reflux.

(see col. 6 ,lines 1-12)

Name of entrainer	I Methyl isobutyl ketone	II n-Butyl alcohol	III Methyl n-amyl ketone	IV 2-methyl butanol-4
Comp. of feed, percent methyl lactate.....	59.2	59.2	59.8	59.8
Percent methyl lactate in discarded water.....	0	0	3.73	0.0078
Percent methyl lactate in entrainer.....	0	0	0.13	0.0078
Feed, ml./minute.....	24	26	14	18
Water separated, ml./minute.....	9	10	5.5	6
Percent lactic acid in residue.....	0.014	0.009	0.009	0.009
Temp. ° C. at the bottom of the column.....	148	145	146	146
Temp. ° C. at the top of the column.....	87	92	94.5	93.5
Azeotropic temperature ° C.....	87	92	94.5	93.5
Entrainer #/# water in azeotropic mixture.....	3.11	1.63	1.30	1.01
Solubility in water.....	1.9 20°C.	9 14°C.	0.4 20°C.	2 14°C.

(see col. lines 47-63)

Art Unit: 1625

The instant invention, however, differs from the prior art in that the lactic acid as the starting material in the claimed process is used instead of the salt of the lactic acid in the prior art; the degree of conversion for lactic acid is from 65 to 75 % ; the flash separation is carried out at a temperature of 152 to 165 ° C.

Regarding the lactic acid vs. the salt of the lactic acid as the starting material in the process, this depends on how to use the final product either in the form of water-soluble ester or water –insoluble ester. Furthermore, it is obvious to form salts from known acids or vice versa . In re Williams, 89 USPQ 396 (CCPA 1951). Therefore, it would have been obvious to the skilled artisan in the art to be motivated to change from the salt of the lactic acid starting material to the regular lactic acid depending on the final end use of the desired product.

Concerning the degree of conversion for lactic acid from 65 to 75 % , the limitation of a process with respect to time, temperature , conversion rate and concentration does not impart patentability to a process when such values are those which would be determined by one of the ordinary skill in the art in achieving optimum operation of the process. The conversion rate of the initial material in the esterification process is well-understood by those of ordinary skill in the art to be a result-effective variable., especially when attempting to control selectivity of the process. Therefore, it would have been obvious to the skilled artisan in the art to be motivated to optimize the degree of conversion for lactic acid by using the % composition of ethyl lactate in the mixture.

Art Unit: 1625

Regarding the temperature difference of the flash separation, the prior art is silent. However, the temperature of the flash separation can be easily estimated from the following passages as shown below:

The temperature of the oil in the kettle is maintained sufficiently low to avoid charring or decomposition of any components of the esterified mixture, but sufficiently high to vaporize the ester, alcohol and water almost instantaneously. The temperature of the oil preferably is maintained between about 85° C. and 145° C. when distilling methyl lactate. Higher temperatures may be used, but this may be undesirable as charring of some components of the mixture may occur. The oil may be maintained at the desired temperature by the use of steam circulated through the coil 32 or by any other desired type of heating means. Despite the fact that methyl lactate boils at 144° C., the vapors of alcohol and methyl lactate and the water vapor leave the oil at about 80° to 100°

From these, it becomes clear that the temperature of the flash separation can be higher than 85 to 145° C. Thus, the claimed range and the prior art range are overlapped each other. Therefore, it would have been obvious to the skilled artisan in the art to be motivated to find the claimed temperature by routine experimentation in the absence of an unexpected result.

Weisberg et al expressly the process of water-soluble alkyl lactates by reacting lactate salt, alcohol, and acid catalyst using the flash separator in conjunction with the fractionating distillation column; furthermore, the same prior art does offer guidance that water-insoluble alkyl lactates can have a good use for lacquer solvents and other purposes (see col. 1, lines 5-11). Therefore, it would have been obvious to the skilled artisan in the art to be motivated to change from the salt of the lactic acid starting

Art Unit: 1625

material to the regular lactic acid depending on the final end use of the desired product. This is because the skilled artisan in the art would expect or predict such a modification to be feasible and successful as guidance shown in the prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Taylor Victor Oh whose telephone number is 571-272-0689. The examiner can normally be reached on 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Janet Andres can be reached on 571-272-0867. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Taylor Victor Oh, MSD,LAC  
Primary Examiner  
Art Unit: 1625

10/28/07